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The sides of this triangle can not all be correct because they are all *odd*.

Assuming that the *area* given is correct, it is required to determine the error in the sides.

I. Solution by M. A. GRUBER, A. M., War Department, Washington, D. C.

Knowing that every integral rational scalene triangle is the sum or the difference of two integral right triangles having equal altitudes, and knowing that 65 and 61 are hypotenuses of integral right triangles, we find that 65, 63, 16; 65, 60, 25; 65, 56, 33; and 65, 52, 39, are the respective sides of the right triangles having the hypotenuse 65; and that 61, 60, 11, are the sides of the only integral right triangle having the hypotenuse 61.

We observe that the triangles whose respective sides are 65, 60, 25, and 61, 60, 11, have the common leg 60. Taking 60 as the altitude, and finding the *sum* and the *difference* of the two triangles, we obtain two integral rational scalene triangles, sides being 65, 61, 36, and 65, 61, 14. The area of the former is $\frac{1}{2}(81 \times 16 \times 20 \times 45) = 1080$, and of the latter, $\frac{1}{2}(70 \times 5 \times 9 \times 56) = 420$.

$\therefore$ The side of the triangle in question should be 14.

II. Solution by J. SCHEFFER, A. M., Hagerstown, Md.

Supposing the sides 61 and 65 to be right, but 21 to be wrong, we may put this side $= 2a$, since it must be an even number. Thus, we get $(63+a)(63-a)(a+2)(a-2) = 420^2$, whence $a^4 - 3973a^2 = -192276$.

$\therefore a = \sqrt{\frac{3973 \pm 3975}{2}}$. Taking the lower sign, we obtain $2a = 14$. Thus, the sides are 14, 61, 65. There may possibly be more rational values for the three sides to produce the area 420.

Also solved by G. B. M. ZERR.

92. Proposed by J. T. COLE, Columbus, O.

A staff $a = 60$ feet high, casting a shadow on a horizontal plane due north $b = 20$ feet long, falls due northeast. Find the area covered by the shadow.

Solution by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Let O, B be the same points in both figures. OC the staff after it has fallen to the ground. OA the staff while falling.

Let $\angle AOB = \theta$, altitude of the sun $= \beta$, $OE = x$, $FE = y$. Then $\beta = \tan^{-1}(a/b) = \tan^{-1}(3)$, $AB = a \sin \theta$, $OB = a \cos \theta$, $OE = EB = (a/\sqrt{2}) \cos \theta$, $BF = AB \cot \beta$.

$$\therefore BF = a \sin \theta \cot \beta = b \sin \theta.$$

$$\therefore x = (a/\sqrt{2}) \cos \theta,$$

$$y = x + b \sin \theta = x + (b/a) \sqrt{a^2 - 2x^2} = y'.$$

Area passed over by the shadow $= CODFC$.

$$\therefore A = \int_0^{a/\sqrt{2}} \int_x^{y'} dx dy = b/a \int_0^{a/\sqrt{2}} \sqrt{a^2 - 2x^2} dx. \quad \therefore A = \frac{1}{2} \pi ab \sqrt{2} = 150 \pi \sqrt{2}.$$

